Appendix A: Building Inventory and Relocation Costs

Documents Included:

- **Relocation Cost Estimate**
- **Individual Village Site Work and Water Sewer Landfill Cost Estimates**
- **Transportation System Costs**
- **Construction Camp Cost Estimate – Kivalina**
- **Construction Camp Cost Estimate – New Sites**
- **Power and Fuel Cost Summary**
- **Buildings Cost Analysis Summary – Move/Replace Buildings**
- **Building 45 Info Sheet**
- **Building 48 Info Sheet**
- **Building 52 Info Sheet**
- **Building 66 Info Sheet**
- **Building 74 Info Sheet**
- **Building 75 Info Sheet**
- **Building 77 Info Sheet**
- **Building 79 Info Sheet**
- **Building 80 Info Sheet**
- **Building 94 Info Sheet**
- **Building 107 Info Sheet**
- **Building 120 Info Sheet**
- **Building 122 Info Sheet**
- **Building 123 Info Sheet**
- **Building 128 Info Sheet**
- **Building 131 Info Sheet**
- **Building 143 Info Sheet**
- **Building 144 Info Sheet**
- **McQueen School Aerial Photo**
- **Gravel Haul Costs / Time Analysis**

Kivalina Relocation
Planning Project
03003.007

Sitework
Cost Estimate
Summary

June 2006

Site	Simiq	Tatchim Isua	Imnakuk Bluffs	Kivalina	Kiniktuuraq	Igrugaivik	Kuugruak
Tasks							
Sitework[1]	$ 167,400,000	$ 70,400,000	$ 165,900,000	$ 109,600,000	$ 163,700,000	$ 164,800,000	$ 164,800,000
Erosion Protection[5]	$ 231,000	$ 231,000	$ 231,000	$ 7,151,550	$ 2,613,600	$ 1,045,440	$ 2,961,750
Construction Camp[2]	$ 606,000	$ 606,000	$ 606,000	$ 902,670	$ 606,000	$ 606,000	$ 606,000
(over 5-year Construction Period)							
Power & Fuel	$ 5,292,000	$ 5,292,000	$ 5,292,000	$ 5,292,000	$ 5,292,000	$ 5,292,000	$ 5,292,000
Move Buildings	$ 1,125,000	$ 1,125,000	$ 1,125,000	$ 1,125,000	$ 1,125,000	$ 1,125,000	$ 1,125,000
New Buildings	$ 52,690,000	$ 52,690,000	$ 52,690,000	$ 52,690,000	$ 52,690,000	$ 52,690,000	$ 52,690,000
Water/Sewer System & Landfill	$ 21,119,261	$ 21,521,638	$ 19,844,807	$ 19,473,814	$ 22,125,007	$ 20,521,057	$ 18,146,638
Transportation System[3]	$ 3,056,000	$ 3,056,000	$ 3,056,000	N/A	N/A	N/A	N/A
Total Cost:	$ 251,500,000	$ 154,900,000	$ 248,700,000	$ 196,200,000	$ 248,200,000	$ 246,100,000	$ 245,600,000

1. Sitework includes airport construction.
2. Construction Camp costs include mobe/demob, construction and removal.
3. Shuttle transportation system costs over 3-year period is proposed between villages, when two villages are operating at the same time.
4. Costs are in 2006 dollars
5. Erosion protection costs are for boat staging area erosion protection, river erosion protection, plus shoreline erosion protection.

Kivalina Relocation
Planning Project
03003.007

Simiq Site Estimate

Sitework
Cost Estimate
Simiq

June 2006

	Task/Item	Quantity	Units/LF	LF of Item	Units	Unit Cost	Total
	Site Preparation						
1	Gravel Source Development	1			LS	$10,000.00	$10,000
2	Site Design Survey	1			LS	$30,000.00	$30,000
3	Mob/Demob	1			LS	$130,000	$130,000
4	Site Pad Gravel (9 ft)	1,489,890	40,227,029	9.00	CY	$70	$104,292,298
5	Road over Lagoon,	4,220					
6	Road to Site, Gravel (includes labor)	14,120			LF	$450	$6,354,000
7	Road to Runway, Gravel (includes labor)	2,560			LF	$450	$1,152,000
8	Road to Sewage Treatment, Gravel (includes labor)	in Runway			LF	$450	
9	Road to Landfill, Gravel (includes labor)	8,500			LF	$450	$3,825,000
10	Road Bridge	60			LF	$200	$12,000
11	Road Culvert	1,000			LF	$25	$25,000
12	Hi-Density Insulation (8")	0			SY	$45	
13	Geotextile Fabric	509,000			SY	$10	$5,090,000
14	Boat Staging Gravel (90 X 660 X 6)	13,200			CY	$70	$924,000
15	Barge Staging Gravel (208 X 208 X 5)	217,800			CY	$70	$15,246,000
16	Runway Gravel (6,000 lf)	221,000			CY	$70	$15,470,000
17	Storm Drainage Piping	14,000			LF	$75	$1,050,000
18	Storm Drainage Manholes	45			EA	$3,000	$135,000
19	Camp Security Fence	1,100			LF	$20	$22,000
20	Camp Raw Water Line	500			LF	$60	$30,000.00
21	Gravel Pad Labor/Season (Task Cost Tab)	2				$3,040,000	$6,080,000
22	Village Construction Camp/Season	5				$167,000	$835,000
23	Airport Runway Labor/Seas. (Task Cost Tab)	2				$3,040,000	$6,080,000
24	Airport Construction Camp/Season	2				$167,000	$334,000
25	Facility Maintenance Equipment	1			LS		$283,900
	Total Sitework Cost						**$167,410,198**

26	Armor Rock	1	5.0	700.0	CY	$50	$175,000
27	2"-8" Rip-Rap	1	2.3	700.0	CY	$20	$32,200
28	Erosion Fabric	1	3.4	700.0	SY	$10	$23,800
	Total Errosion Protection Cost						**$231,000**

Assumptions

1 * Construction Camp Cost covers the entire construction season.
2 Road bridges will be precast, reinforced concrete manufactured off site and delivered
3 Gravel cost is delivered to site. Placement of gravel is included in Item 22 Gravel Pad Labor
4 Camp water line will be of different length depending on the location of the site. Length used is a guess from knowledge of site area.
5 All periods used for construction duration have been taken from Kivalina Master Relocation Schedule, Phase 6, dated 11/16/04
6 Site survey shown here is for initial design survey. Survey required during construction is included in Items 22, 24. Design survey for airport is included.
7 Mob/Demob cost shown is a one-time cost associated with shipping equipment and camp to/from the site and set-up/tear-down at beginning/end of project.
8 Item 4 Site Pad Gravel is calculated using 2-depths; one using gravel alone and a second (Alt) using gravel over hi-density foam insulation.
9 Items 5, 6, 7, 8, 9 are gravel costs for material volume required to build roads to access the sites. Labor for placement is included in Items 22, 24
10 Items 10, 11 are guesses at the number of
11 Armor Rock shown in Item 26 is assumed to be minimum 4-man rock.
12 The 2"-8" rip-rap shown in Item 27 is fill behind Armor Rock.
13 Facility Maintenance Equipment item assumes contractor will leave used: backhoe/loader, road grader, small dozer, 10 YD dump truck for community use at comonstuction completion

Grader, 1999 Cat 140HNA	$145,000.00
Backhoe/Loader, 2001 Cat 416C	$45,000.00
Dozer, 1998 Cat D4CIIIXL	$54,000.00
Dump Truck, 1998 Ford L9501	$39,900.00
	$283,900.00

Estimated Costs
Simiq

Village
Kivalina | Simiq

Item No.	Line Item Description	Unit	Estimated Quantity	Adjusted Unit Cost	Total Cost
1	Household water and sewer plumbing	EA	100	$20,267.59	$2,026,759
2	Sewage collection mains or services (gravity or force), buried	LF		#DIV/0!	$0
3	Sewage collection mains or services (gravity or force), above ground	LF	13,325	$102.59	$1,366,994
4	Sewage lift station	EA	1	$281,226.02	$281,226
5	Vacuum sewer plant, no foundation	SF	2,500	$487.80	$1,219,492
6	Septic tank, and drainfield, individual household	EA	0	#DIV/0!	$0
7	Septic tank, community	EA	0	#DIV/0!	$0
8	Drainfield, community	SF	0	#DIV/0!	$0
9	Utilidors, above ground, including water and sewer, mains or services	LF	5,000	$286.71	$1,433,543
10	Sewage lagoon, barrow, local material	Acre	10	$201,278.84	$2,012,788
11	Sewage discharge works	LF	6,745	$131.14	$884,565
12	Water distribution, mains or services, above ground	LF	17,895	$96.61	$1,728,842
13	Water distribution, mains or services, buried	LF		#DIV/0!	$0
14	Water storage tank, no foundation	Gal	460,000	$1.63	$750,318
15	Water treatment plant, no foundation	SF	2,500	$590.47	$1,476,176
16	Washeteria, no foundation	SF	600	$761.47	$456,885
17	Foundation - conventional, local gravel material	SF	0	#DIV/0!	$0
18	Foundation - freeze back piles	SF	0	#DIV/0!	$0
19	Foundation - thermosyphen stablized gravel pad	SF	7,300	$90.27	$658,951
20	Boardwalk	LF	0	#DIV/0!	$0
21	Road, local gravel source	LF	0	#DIV/0!	$0
22	Water source - surface water intake/ground water well	EA	1	$185,500.02	$185,500
24	Water heating system (boiler system in water treatment building)	EA	1	$2,500.00	$2,500
25	Water delivery piping system (from source to treatment plant)	LF	9,060	$200.00	$1,812,000
26	Fire suppression system (fire hydrants around the village)	EA	25	$2,000.00	$50,000
27	Solid waste site - closure, local material	Acre	5	$38,034.22	$190,171
28	Solid waste site - development, local material w/ equipment	Acre	10	$90,929.16	$909,292
29	Shop / Garage, no foundation, concrete floor	SF	400	$383.45	$153,382

Total Estimated Cost: **$17,599,384**

Kivalina Relocation
Planning Project
03003.007

Tatchim Isua Site Estimate

Sitework
Cost Estimate
Tatchim Isua

June 2006

	Task/Item	Quantity	Units/LF	Item LF	Units	Unit Cost	Total
	Site Preparation						
1	Gravel Source Development	1			LS	$10,000.00	$10,000
2	Site Design Survey	1			LS	$30,000.00	$30,000
3	Mob/Demob	1			LS	$130,000	$130,000
4	Site Pad Gravel (3 ft)	488,186	13181022	3.00	CY	$45	$21,968,370
5	Road over Lagoon	0			LF		
6	Road to Site, Gravel	7,930			LF	$450	$3,568,500
7	Road to Runway, Gravel	1,640			LF	$450	$738,000
8	Road to Sewage Treatment, Gravel	300			LF	$450	$135,000
9	Road to Landfill, Gravel	7,460			LF	$450	$3,357,000
10	Road Bridge	30			LF	$200	$6,000
11	Road Culvert	300			LF	$25	$7,500
12	Hi-Density Insulation (8")	0			SY	$45	
13	Geotextile Fabric	509,000			SY	$10	$5,090,000
14	Boat Staging Gravel (90 X 660 X 6)	13,200			CY	$45	$594,000
15	Barge Staging Gravel (208 X 208 X 5)	217,800			CY	$45	$9,801,000
16	Runway Gravel (6,000 lf)	221,000			CY	$45	$9,945,000
17	Camp Water line	3,700			LF	$60	$222,000
18	Storm Drainage Piping	14,000			LF	$75	$1,050,000
19	Storm Drainage Manholes	45			EA	$3,000	$135,000
20	Camp Security Fence	1,100			LF	$20	$22,000
21	Gravel Pad Labor/Season (Task Cost Tab)	2				$3,040,000	$6,080,000
22	Village Construction Camp/Season	5				$167,000	$835,000
23	Airport Runway Labor/Seas. (Task Cost Tab)	2				$3,040,000	$6,080,000
24	Airport Construction Camp/Season	2				$167,000	$334,000
25	Facility Maintenance Equipment	1			LS		$283,900
	Total Sitework Cost						**$70,422,270**

26	Armor Rock	1	5.0	700.0	CY	$50	$175,000
27	2"-8" Rip-Rap	1	2.3	700.0	CY	$20	$32,200
28	Erosion Fabric	1	3.4	700.0	SY	$10	$23,800
	Total Errosion Protection Cost						**$231,000**

Assumptions

1 * Construction Camp Cost covers the entire construction season.
2 Road bridges will be precast, reinforced concrete manufactured off site and delivered
3 Gravel cost is delivered to site. Placement of gravel is included in Item 21 Gravel Pad Labor
4 Camp water line will be of different length depending on the location of the site. Length used is a guess from knowledge of site area.
5 All periods used for construction duration have been taken from Kivalina Master Relocation Schedule, Phase 6, dated 11/16/04
6 Site survey shown here is for initial design survey. Survey required during construction is included in Items 22, 24. Design survey for airport is included.
7 Mob/Demob cost shown is a one-time cost associated with shipping equipment and camp to/from the site and set-up/tear-down at beginning/end of project.
8 Item 4 Site Pad Gravel is calculated using 2-depths; one using gravel alone and a second (Alt) using gravel over hi-density foam insulation.
9 Items 5, 6, 7, 8, 9 are gravel costs for material volume required to build roads to access the sites. Labor for placement is included in Items 22, 24
10 Items 10, 11 are guesses at the number of
11 Armor Rock shown in Item 26 is assumed to be minimum 4-man rock.
12 The 2"-8" rip-rap shown in Item 27 is fill behind Armor Rock.
13 Facility Maintenance Equipment item assumes

Grader, 1999 Cat 140HNA	$145,000.00
Backhoe/Loader, 2001 Cat 416C	$45,000.00
Dozer, 1998 Cat D4CIIIXL	$54,000.00
Dump Truck, 1998 Ford L9501	$39,900.00
	$283,900.00

Equipment costs taken from internet web search of used equipment for sale

Estimated Costs
Tatchim Isua

Village
Kivalina | Tatchim Isua

Item No.	Line Item Description	Unit	Estimated Quantity	Adjusted Unit Cost	Total Cost
1	Household water and sewer plumbing	EA	100	$20,267.59	$2,026,759
2	Sewage collection mains or services (gravity or force), buried	LF	13,000	$87.81	$1,141,574
3	Sewage collection mains or services (gravity or force), above ground	LF	13,325	$102.59	$1,366,994
4	Sewage lift station	EA	1	$281,226.02	$281,226
5	Vacuum sewer plant, no foundation	SF		#DIV/0!	$0
6	Septic tank, and drainfield, individual household	EA	0	#DIV/0!	$0
7	Septic tank, community	EA	0	#DIV/0!	$0
8	Drainfield, community	SF	0	#DIV/0!	$0
9	Utilidors, above ground, including water and sewer, mains or services	LF	5,000	$286.71	$1,433,543
10	Sewage lagoon, barrow, local material	Acre	10	$201,278.84	$2,012,788
11	Sewage discharge works	LF	7,460	$129.46	$965,748
12	Water distribution, mains or services, above ground	LF	17,895	$96.61	$1,728,842
13	Water distribution, mains or services, buried	LF	13,000	$86.08	$1,119,049
14	Water storage tank, no foundation	Gal	460,000	$1.63	$750,318
15	Water treatment plant, no foundation	SF	2,500	$590.47	$1,476,176
16	Washeteria, no foundation	SF	600	$761.47	$456,885
17	Foundation - conventional, local gravel material	SF	0	#DIV/0!	$0
18	Foundation - freeze back piles	SF	0	#DIV/0!	$0
19	Foundation - thermosyphen stablized gravel pad	SF	7,300	$90.27	$658,951
20	Boardwalk	LF	0	#DIV/0!	$0
21	Road, local gravel source	LF	0	#DIV/0!	$0
22	Water source - surface water intake/ground water well	EA	1	$185,500.02	$185,500
24	Water heating system (boiler system in water treatment building)	EA	1	$2,500.00	$2,500
25	Water delivery piping system (from source to treatment plant)	LF	5,125	$200.00	$1,025,000
26	Fire suppression system (fire hydrants around the village)	EA	25	$2,000.00	$50,000
27	Solid waste site - closure, local material	Acre	5	$38,034.22	$190,171
28	Solid waste site - development, local material w/ equipment	Acre	10	$90,929.16	$909,292
29	Shop / Garage, no foundation, concrete floor	SF	400	$383.45	$153,382

Total Estimated Cost: **$17,934,698**

Kivalina Relocation
Planning Project
03003.007

Imnakuk Bluffs Site Estimate

Sitework
Cost Estimate
Imnakuk Bluffs

June 2006

	Task/Item	Quantity	Units/LF	Item LF	Units	Unit Cost	Total
	Site Preparation						
1	Gravel Source Development	1			LS	$10,000.00	$10,000
2	Site Design Survey	1			LS	$30,000.00	$30,000
3	Mob/Demob	1			LS	$130,000	$130,000
4	Site Pad Gravel (9 ft)	1,489,890	40,227,029	9.00	CY	$70	$104,292,298
5	Road over Lagoon	6,095			LF		$0
6	Road to Site, Gravel	10,425			LF	$450	$4,691,250
7	Road to Runway, Gravel	1,030			LF	$450	$463,500
8	Road to Sewage Treatment, Gravel	800			LF	$450	$360,000
9	Road to Landfill, Gravel	8,050			LF	$450	$3,622,500
10	Road Bridge	60			LF	$200	$12,000
11	Road Culvert	400			LF	$25	$10,000
12	Hi-Density Insulation (8")	0			SY	$45	$0
13	Geotextile Fabric	509,000			SY	$10	$5,090,000
14	Boat Staging Gravel (90 X 660 X 6)	13,200			CY	$70	$924,000
15	Barge Staging Gravel (208 X 208 X 5)	217,800			CY	$70	$15,246,000
16	River Dike	1	3.7	3,700.0	CY	$50	$684,500
17	Runway Gravel (6,000 lf)	221,000			CY	$70	$15,470,000
18	Camp Water line	500			LF	$60	$30,000
19	Storm Drainage Piping	14,000			LF	$75	$1,050,000
20	Storm Drainage Manholes	45			EA	$3,000	$135,000
21	Camp Security Fence	1,100			LF	$20	$22,000
22	Gravel Pad Labor/Season (Task Cost Tab)	2				$3,040,000	$6,080,000
23	Village Construction Camp/Season	5				$167,000	$835,000
24	Airport Runway Labor/Seas. (Task Cost Tab)	2				$3,040,000	$6,080,000
25	Airport Construction Camp/Season	2				$167,000	$334,000
26	Facility Maintenance Equipment	1			LS		$283,900
	Total Sitework Cost						**$165,885,948**

27	Armor Rock	1	5.0	700.0	CY	$50	$175,000
28	2"-8" Rip-Rap	1	2.3	700.0	CY	$20	$32,200
29	Erosion Fabric	1	3.4	700.0	SY	$10	$23,800
	Total Errosion Protection Cost						**$231,000**

Assumptions

1 * Construction Camp Cost covers the entire construction season.
2 Road bridges will be precast, reinforced concrete manufactured off site and delivered
3 Gravel cost is delivered to site. Placement of gravel is included in Item 21 Gravel Pad Labor
4 Camp water line will be of different length depending on the location of the site. Length used is a guess from knowledge of site area.
5 All periods used for construction duration have been taken from Kivalina Master Relocation Schedule, Phase 6, dated 11/16/04
6 Site survey shown here is for initial design survey. Survey required during construction is included in Items 22, 24. Design survey for airport is included.
7 Mob/Demob cost shown is a one-time cost associated with shipping equipment and camp to/from the site and set-up/tear-down at beginning/end of project.
8 Item 4 Site Pad Gravel is calculated using 2-depths; one using gravel alone and a second (Alt) using gravel over hi-density foam insulation.
9 Items 5, 6, 7, 8, 9 are gravel costs for material volume required to build roads to access the sites. Labor for placement is included in Items 22, 24
10 Items 10, 11 are guesses at the number of water course spanning structures required for the roads. These numbers will differ depending on the length of road
11 Armor Rock shown in Item 27 is assumed to be minimum 4-man rock.
12 The 2"-8" rip-rap shown in Item 28 is fill behind Armor Rock.
13 Item 16, River Dike is a directional dike constructed of Armor Rock at the mouth of the Kivalina River to redirect flow path to reduce siltation of dredged
14 Facility Maintenance Equipment item assumes contractor will leave used: backhoe/loader, road grader, small dozer, 10 YD dump truck for community use at

Grader, 1999 Cat 140HNA	$145,000.00
Backhoe/Loader, 2001 Cat 416C	$45,000.00
Dozer, 1998 Cat D4CIIIXL	$54,000.00
Dump Truck, 1998 Ford L9501	$39,900.00
	$283,900.00

Equipment costs taken from internet web search of used equipment for sale

Estimated Costs
Imnakuk Bluff

Village
Kivalina | Imnakuk Bluff

Item No.	Line Item Description	Unit	Estimated Quantity	Adjusted Unit Cost	Total Cost
1	Household water and sewer plumbing	EA	100	$20,267.59	$2,026,759
2	Sewage collection mains or services (gravity or force), buried	LF		#DIV/0!	$0
3	Sewage collection mains or services (gravity or force), above ground	LF	13,325	$102.59	$1,366,994
4	Sewage lift station	EA	1	$281,226.02	$281,226
5	Vacuum sewer plant, no foundation	SF	2,500	$487.80	$1,219,492
6	Septic tank, and drainfield, individual household	EA	0	#DIV/0!	$0
7	Septic tank, community	EA	0	#DIV/0!	$0
8	Drainfield, community	SF	0	#DIV/0!	$0
9	Utilidors, above ground, including water and sewer, mains or services	LF	5,000	$286.71	$1,433,543
10	Sewage lagoon, barrow, local material	Acre	10	$201,278.84	$2,012,788
11	Sewage discharge works	LF	3,345	$149.03	$498,520
12	Water distribution, mains or services, above ground	LF	17,895	$96.61	$1,728,842
13	Water distribution, mains or services, buried	LF		#DIV/0!	$0
14	Water storage tank, no foundation	Gal	460,000	$1.63	$750,318
15	Water treatment plant, no foundation	SF	2,500	$590.47	$1,476,176
16	Washeteria, no foundation	SF	600	$761.47	$456,885
17	Foundation - conventional, local gravel material	SF	0	#DIV/0!	$0
18	Foundation - freeze back piles	SF	0	#DIV/0!	$0
19	Foundation - thermosyphen stablized gravel pad	SF	7,300	$90.27	$658,951
20	Boardwalk	LF	0	#DIV/0!	$0
21	Road, local gravel source	LF	0	#DIV/0!	$0
22	Water source - surface water intake/ground water well	EA	1	$185,500.02	$185,500
24	Water heating system (boiler system in water treatment building)	EA	1	$2,500.00	$2,500
25	Water delivery piping system (from source to treatment plant)	LF	5,680	$200.00	$1,136,000
26	Fire suppression system (fire hydrants around the village)	EA	25	$2,000.00	$50,000
27	Solid waste site - closure, local material	Acre	5	$38,034.22	$190,171
28	Solid waste site - development, local material w/ equipment	Acre	10	$90,929.16	$909,292
29	Shop / Garage, no foundation, concrete floor	SF	400	$383.45	$153,382

Total Estimated Cost: **$16,537,339**

Kivalina Relocation
Planning Project
03003.007

Sitework
Cost Estimate
Kiniktuuraq

June 2006

Kiiktuuraq Site Estimate

	Task/Item		Quantity		Units/LF	LF of Item		Units		Unit Cost		Total
	Site Preparation											
1	Gravel Source Development		1					LS		$10,000		$10,000
2	Site Design Survey		1					LS		$30,000		$30,000
3	Mob/Demob		1					LS		$130,000		$130,000
4	Site Pad Gravel (9 ft)		1,489,890		40,227,029.13	9.00		CY		$70		$104,292,298
5	Road over Lagoon		0					LF				
6	Road to Site, Gravel		0					LF		$450		$0
7	Road to Runway, Gravel		15,815					LF		$450		$7,116,750
8	Road to Sewage Treatment, Gravel		540					LF		$450		$243,000
9	Road to Landfill, Gravel		600					LF		$450		$270,000
10	Road Bridge		60					LF		$200		$12,000
11	Road Culvert		200					LF		$25		$5,000
12	Hi-Density Insulation (8")		0					SY		$45		
13	Geotextile Fabric		509,000					SY		$10		$5,090,000
14	Boat Staging Gravel (90 X 660 X 6)		13,200					CY		$70		$924,000
15	Barge Staging Gravel (208 X 208 X 5)		217,800					CY		$70		$15,246,000
16	River Dike		1		3.7	0.0		CY		$50		
17	Runway Gravel (6,000 lf)		221,000					CY		$70		$15,470,000
18	Camp Water line		500					LF		$60		$30,000
19	Storm Drainage Piping		14,000					LF		$75		$1,050,000
20	Storm Drainage Manholes		45					EA		$3,000		$135,000
21	Camp Security Fence		1,100					LF		$20		$22,000
22	Gravel Pad Labor/Season (Task Cost Tab)		2							$3,040,000		$6,080,000
23	Village Construction Camp/Season		5							$167,000		$835,000
24	Airport Runway Labor/Seas. (Task Cost Tab)		2							$3,040,000		$6,080,000
25	Airport Construction Camp/Season		2							$167,000		$334,000
26	Facility Maintenance Equipment		1					LS				$283,900
	Total Sitework Cost											**$163,688,948**

27	Armor Rock		1		5.0	7920.0		CY		$50		$1,980,000
28	2"-8" Rip-Rap		1		2.3	7920.0		CY		$20		$364,320
29	Erosion Fabric		1		3.4	7920.0		SY		$10		$269,280
	Total Errosion Protection Cost											**$2,613,600**

Assumptions

1 * Construction Camp Cost covers the entire construction season.
2 Road bridges will be precast, reinforced concrete manufactured off site and delivered
3 Gravel cost is delivered to site. Placement of gravel is included in Item 21 Gravel Pad Labor
4 Camp water line will be of different length depending on the location of the site. Length used is a guess from knowledge of site area.
5 All periods used for construction duration have been taken from Kivalina Master Relocation Schedule, Phase 6, dated 11/16/04
6 Site survey shown here is for initial design survey. Survey required during construction is included in Items 20,22. Design survey for airport is included.
7 Mob/Demob cost shown is a one-time cost associated with shipping equipment and camp to/from the site and set-up/tear-down at beginning/end of project.
8 Item 4 Site Pad Gravel is calculated using 2-depths; one using gravel alone and a second (Alt) using gravel over hi-density foam insulation.
9 Items 5, 6, 7, 8, 9 are gravel costs for material volume required to build roads to access the sites. Labor for placement is included in Items 20, 22
10 Items 10, 11 are guesses at the number of water course spanning structures required for the roads. These numbers will differ depending on the length of road needed.
11 Armor Rock shown in Item 27 is assumed to be minimum 4-man rock.
12 The 2"-8" rip-rap shown in Item 28 is fill behind Armor Rock.
13 Item 16, River Dike is a directional dike constructed of Armor Rock at the mouth of the Kivalina River to redirect flow path to reduce siltation of dredged channel.
14 Facility Maintenance Equipment item assumes contractor will leave used: backhoe/loader, road grader, small dozer, 10 YD dump truck for community use at comonstuction

Grader, 1999 Cat 140HNA	$145,000.00
Backhoe/Loader, 2001 Cat 416C	$45,000.00
Dozer, 1998 Cat D4CIIIXL	$54,000.00
Dump Truck, 1998 Ford L9501	$39,900.00
	$283,900.00
	$422,800.00

Equipment costs taken from internet web search of used equipment for sale

Estimated Costs
Kinituuraq

Village
Kivalina | Kinituuraq

Item No.	Line Item Description	Unit	Estimated Quantity	Adjusted Unit Cost	Total Cost
1	Household water and sewer plumbing	EA	100	$20,267.59	$2,026,759
2	Sewage collection mains or services (gravity or force), buried	LF		#DIV/0!	$0
3	Sewage collection mains or services (gravity or force), above ground	LF	13,325	$102.59	$1,366,994
4	Sewage lift station	EA	1	$281,226.02	$281,226
5	Vacuum sewer plant, no foundation	SF	1	$34,746.09	$34,746
6	Septic tank, and drainfield, individual household	EA	0	#DIV/0!	$0
7	Septic tank, community	EA	0	#DIV/0!	$0
8	Drainfield, community	SF	0	#DIV/0!	$0
9	Utilidors, above ground, including water and sewer, mains or services	LF	5,000	$286.71	$1,433,543
10	Sewage lagoon, barrow, local material	Acre	10	$201,278.84	$2,012,788
11	Sewage discharge works	LF	10,575	$124.77	$1,319,433
12	Water distribution, mains or services, above ground	LF	17,895	$96.61	$1,728,842
13	Water distribution, mains or services, buried	LF		#DIV/0!	$0
14	Water storage tank, no foundation	Gal	460,000	$1.63	$750,318
15	Water treatment plant, no foundation	SF	2,500	$590.47	$1,476,176
16	Washeteria, no foundation	SF	600	$761.47	$456,885
17	Foundation - conventional, local gravel material	SF	0	#DIV/0!	$0
18	Foundation - freeze back piles	SF	0	#DIV/0!	$0
19	Foundation - thermosyphen stablized gravel pad	SF	7,300	$90.27	$658,951
20	Boardwalk	LF	0	#DIV/0!	$0
21	Road, local gravel source	LF	0	#DIV/0!	$0
22	Water source - surface water intake/ground water well	EA	1	$185,500.02	$185,500
24	Water heating system (boiler system in water treatment building)	EA	1	$2,500.00	$2,500
25	Water delivery piping system (from source to treatment plant)	LF	17,000	$200.00	$3,400,000
26	Fire suppression system (fire hydrants around the village)	EA	25	$2,000.00	$50,000
27	Solid waste site - closure, local material	Acre	5	$38,034.22	$190,171
28	Solid waste site - development, local material w/ equipment	Acre	10	$90,929.16	$909,292
29	Shop / Garage, no foundation, concrete floor	SF	400	$383.45	$153,382

Total Estimated Cost: **$18,437,506**

Kivalina Relocation
Planning Project
03003.007

Igrugaivik Site Estimate

Sitework
Cost Estimate
Igrugaivik

June 2006

	Task/Item	Quantity	Units/LF	LF of Item	Units	Unit Cost	Total
	Site Preparation						
1	Gravel Source Development	1			LS	$10,000	$10,000
2	Site Design Survey	1			LS	$30,000	$30,000
3	Mob/Demob	1			LS	$130,000	$130,000
4	Site Pad Gravel (9 ft)	1,489,890	40227029	9.00	CY	$70	$104,292,298
5	Road over Lagoon	0			LF		
6	Road to Site, Gravel	6,470			LF	$450	$2,911,500
7	Road to Runway, Gravel	4,495			LF	$450	$2,022,750
8	Road to Sewage Treatment, Gravel	1,385			LF	$450	$623,250
9	Road to Landfill, Gravel	in Sewage			LF	$450	
10	Road Bridge	90			LF	$200	$18,000
11	Road Culvert	300			LF	$25	$7,500
12	Hi-Density Insulation (8")	0			SY	$45	
13	Geotextile Fabric	509,000			SY	$10	$5,090,000
14	Boat Staging Gravel (90 X 660 X 6)	13,200			CY	$70	$924,000
15	Barge Staging Gravel (208 X 208 X 5)	217,800			CY	$70	$15,246,000
16	River Dike	1	3.7	0.0	CY	$50	
17	Runway Gravel (4,000 lf)	266,000			CY	$70	$18,620,000
18	Camp Water line	500			LF	$60	$30,000
19	Storm Drainage Piping	14,000			LF	$75	$1,050,000
20	Storm Drainage Manholes	45			EA	$3,000	$135,000
21	Camp Security Fence	1,100			LF	$20	$22,000
22	Gravel Pad Labor/Season (Task Cost Tab)	2				$3,040,000	$6,080,000
23	Village Construction Camp/Season	5				$167,000	$835,000
24	Airport Runway Labor/Seas. (Task Cost Tab)	2				$3,040,000	$6,080,000
25	Airport Construction Camp/Season	2				$167,000	$334,000
26	Facility Maintenance Equipment	1			LS		$283,900
	Total Sitework Cost						**$164,775,198**

27	Armor Rock	1	5.0	3168.0	CY	$50	$792,000
28	2"-8" Rip-Rap	1	2.3	3168.0	CY	$20	$145,728
29	Erosion Fabric	1	3.4	3168.0	SY	$10	$107,712
	Total Errosion Protection Cost						**$1,045,440**

Assumptions

1 * Construction Camp Cost covers the entire construction season.
2 Road bridges will be precast, reinforced concrete manufactured off site and delivered
3 Gravel cost is delivered to site. Placement of gravel is included in Item 26 Gravel Pad Labor
4 Camp water line will be of different length depending on the location of the site. Length used is a guess from knowledge of site area.
5 All periods used for construction duration have been taken from Kivalina Master Relocation Schedule, Phase 6, dated 11/16/04
6 Site survey shown here is for initial design survey. Survey required during construction is included in Items 22, 24. Design survey for airport is included.
7 Mob/Demob cost shown is a one-time cost associated with shipping equipment and camp to/from the site and set-up/tear-down at beginning/end of project.
8 Item 4 Site Pad Gravel is calculated using 2-depths; one using gravel alone and a second (Alt) using gravel over hi-density foam insulation.
9 Items 5, 6, 7, 8, 9 are gravel costs for material volume required to build roads to access the sites. Labor for placement is included in Items 22, 24
10 Items 10, 11 are guesses at the number of water course spanning structures required for the roads. These numbers will differ depending on the length of road
11 Armor Rock shown in Item 27 is assumed to be minimum 4-man rock.
12 The 2"-8" rip-rap shown in Item 28 is fill behind Armor Rock.
13 Item 16, River Dike is a directional dike constructed of Armor Rock at the mouth of the Kivalina River to redirect flow path to reduce siltation of dredged channel.
14 Facility Maintenance Equipment item assumes contractor will leave used: backhoe/loader, road grader, small dozer, 10 YD dump truck for community use at

Grader, 1999 Cat 140HNA	$145,000.00
Backhoe/Loader, 2001 Cat 416C	$45,000.00
Dozer, 1998 Cat D4CIIIXL	$54,000.00
Dump Truck, 1998 Ford L9501	$39,900.00
	$283,900.00

Equipment costs taken from internet web search of used equipment for sale

Estimated Costs
Igrugaivik

Village
Kivalina | Igrugaivik

Item No.	Line Item Description	Unit	Estimated Quantity	Adjusted Unit Cost	Total Cost
1	Household water and sewer plumbing	EA	100	$20,267.59	$2,026,759
2	Sewage collection mains or services (gravity or force), buried	LF		#DIV/0!	$0
3	Sewage collection mains or services (gravity or force), above ground	LF	13,325	$102.59	$1,366,994
4	Sewage lift station	EA	1	$281,226.02	$281,226
5	Vacuum sewer plant, no foundation	SF	2,500	$487.80	$1,219,492
6	Septic tank, and drainfield, individual household	EA	0	#DIV/0!	$0
7	Septic tank, community	EA	0	#DIV/0!	$0
8	Drainfield, community	SF	0	#DIV/0!	$0
9	Utilidors, above ground, including water and sewer, mains or services	LF	5,000	$286.71	$1,433,543
10	Sewage lagoon, barrow, local material	Acre	10	$201,278.84	$2,012,788
11	Sewage discharge works	LF	3,385	$148.61	$503,062
12	Water distribution, mains or services, above ground	LF	17,895	$96.61	$1,728,842
13	Water distribution, mains or services, buried	LF		#DIV/0!	$0
14	Water storage tank, no foundation	Gal	460,000	$1.63	$750,318
15	Water treatment plant, no foundation	SF	2,500	$590.47	$1,476,176
16	Washeteria, no foundation	SF	600	$761.47	$456,885
17	Foundation - conventional, local gravel material	SF	0	#DIV/0!	$0
18	Foundation - freeze back piles	SF	0	#DIV/0!	$0
19	Foundation - thermosyphen stablized gravel pad	SF	7,300	$90.27	$658,951
20	Boardwalk	LF	0	#DIV/0!	$0
21	Road, local gravel source	LF	0	#DIV/0!	$0
22	Water source - surface water intake/ground water well	EA	1	$185,500.02	$185,500
24	Water heating system (boiler system in water treatment building)	EA	1	$2,500.00	$2,500
25	Water delivery piping system (from source to treatment plant)	LF	8,475	$200.00	$1,695,000
26	Fire suppression system (fire hydrants around the village)	EA	25	$2,000.00	$50,000
27	Solid waste site - closure, local material	Acre	5	$38,034.22	$190,171
28	Solid waste site - development, local material w/ equipment	Acre	10	$90,929.16	$909,292
29	Shop / Garage, no foundation, concrete floor	SF	400	$383.45	$153,382

Total Estimated Cost: **$17,100,881**

Kivalina Relocation
Planning Project
03003.007

Kuugruak Site Estimate

Sitework
Cost Estimate
Kuugruak

June 2006

	Task/Item	Quantity	Units/LF	LF of Item	Units	Unit Cost	Total
	Site Preparation						
1	Gravel Source Development	1			LS	$10,000	$10,000
2	Site Design Survey	1			LS	$30,000	$30,000
3	Mob/Demob	1			LS	$130,000	$130,000
4	Site Pad Gravel (9 ft)	1,489,890	40227029	9.00	CY	$70	$104,292,298
5	Road over Lagoon	0			LF		
6	Road to Site, Gravel	9,330			LF	$450	$4,198,500
7	Road to Runway, Gravel	7,775			LF	$450	$3,498,750
8	Road to Sewage Treatment, Gravel	1,815			LF	$450	$816,750
9	Road to Landfill, Gravel	475			LF	$450	$213,750
10	Road Bridge	120			LF	$200	$24,000
11	Road Culvert	200			LF	$25	$5,000
12	Hi-Density Insulation (8")	0			SY	$45	
13	Geotextile Fabric	509,000			SY	$10	$5,090,000
14	Boat Staging Gravel (90 X 660 X 6)	13,200			CY	$70	$924,000
15	Barge Staging Gravel (208 X 208 X 5)	217,800			CY	$70	$15,246,000
16	Runway Gravel (6,000 lf)	221,000			CY	$70	$15,470,000
17	Camp Water line	500			LF	$60	$30,000
18	Storm Drainage Piping	14,000			LF	$75	$1,050,000
19	Storm Drainage Manholes	45			EA	$3,000	$135,000
20	Camp Security Fence	1,100			LF	$20	$22,000
21	Gravel Pad Labor/Season (Task Cost Tab)	2				$3,040,000	$6,080,000
22	Village Construction Camp/Season	5				$167,000	$835,000
23	Airport Runway Labor/Seas. (Task Cost Tab)	2				$3,040,000	$6,080,000
24	Airport Construction Camp/Season	2				$167,000	$334,000
25	Facility Maintenance Equipment	1			LS		$283,900
	Total Sitework Cost						**$164,798,948**

26	Armor Rock	1	5.0	8975.0	CY	$50	$2,243,750
27	2"-8" Rip-Rap	1	2.3	8975.0	CY	$20	$412,850
28	Erosion Fabric	1	3.4	8975.0	SY	$10	$305,150
	Total Errosion Protection Cost						**$2,961,750**

Assumptions

1 * Construction Camp Cost covers the entire construction season.
2 Road bridges will be precast, reinforced concrete manufactured off site and delivered
3 Gravel cost is delivered to site. Placement of gravel is included in Item 26 Gravel Pad Labor
4 Camp water line will be of different length depending on the location of the site. Length used is a guess from knowledge of site area.
5 All periods used for construction duration have been taken from Kivalina Master Relocation Schedule, Phase 6, dated 11/16/04
6 Site survey shown here is for initial design survey. Survey required during construction is included in Items 22, 24. Design survey for airport is included.
7 Mob/Demob cost shown is a one-time cost associated with shipping equipment and camp to/from the site and set-up/tear-down at beginning/end of project.
8 Item 4 Site Pad Gravel is calculated using 2-depths; one using gravel alone and a second (Alt) using gravel over hi-density foam insulation.
9 Items 5, 6, 7, 8, 9 are gravel costs for material volume required to build roads to access the sites. Labor for placement is included in Items 22, 24
10 Items 10, 11 are guesses at the number of water course spanning structures required for the roads. These numbers will differ depending on the length of road
11 Armor Rock shown in Item 26 is assumed to be minimum 4-man rock.
12 The 2"-8" rip-rap shown in Item 27 is fill behind Armor Rock.
13 Facility Maintenance Equipment item assumes contractor will leave used: backhoe/loader, road grader, small dozer, 10 YD dump truck for community use at comonstuction completion

Grader, 1999 Cat 140HNA	$145,000.00
Backhoe/Loader, 2001 Cat 416C	$45,000.00
Dozer, 1998 Cat D4CIIIXL	$54,000.00
Dump Truck, 1998 Ford L9501	$39,900.00
	$283,900.00

Equipment costs taken from internet web search of used equipment for sale

Estimated Costs
Kuugruaq

Village
Kivalina | Kuugruaq

Item No.	Line Item Description	Unit	Estimated Quantity	Adjusted Unit Cost	Total Cost
1	Household water and sewer plumbing	EA	100	$20,267.59	$2,026,759
2	Sewage collection mains or services (gravity or force), buried	LF		#DIV/0!	$0
3	Sewage collection mains or services (gravity or force), above ground	LF	13,325	$102.59	$1,366,994
4	Sewage lift station	EA	1	$281,226.02	$281,226
5	Vacuum sewer plant, no foundation	SF	1	$34,746.09	$34,746
6	Septic tank, and drainfield, individual household	EA	0	#DIV/0!	$0
7	Septic tank, community	EA	0	#DIV/0!	$0
8	Drainfield, community	SF	0	#DIV/0!	$0
9	Utilidors, above ground, including water and sewer, mains or services	LF	5,000	$286.71	$1,433,543
10	Sewage lagoon, barrow, local material	Acre	10	$201,278.84	$2,012,788
11	Sewage discharge works	LF	4,645	$139.10	$646,125
12	Water distribution, mains or services, above ground	LF	17,895	$96.61	$1,728,842
13	Water distribution, mains or services, buried	LF		#DIV/0!	$0
14	Water storage tank, no foundation	Gal	460,000	$1.63	$750,318
15	Water treatment plant, no foundation	SF	2,500	$590.47	$1,476,176
16	Washeteria, no foundation	SF	600	$761.47	$456,885
17	Foundation - conventional, local gravel material	SF	0	#DIV/0!	$0
18	Foundation - freeze back piles	SF	0	#DIV/0!	$0
19	Foundation - thermosyphen stablized gravel pad	SF	7,300	$90.27	$658,951
20	Boardwalk	LF	0	#DIV/0!	$0
21	Road, local gravel source	LF	0	#DIV/0!	$0
22	Water source - surface water intake/ground water well	EA	1	$185,500.02	$185,500
24	Water heating system (boiler system in water treatment building)	EA	1	$2,500.00	$2,500
25	Water delivery piping system (from source to treatment plant)	LF	3,790	$200.00	$758,000
26	Fire suppression system (fire hydrants around the village)	EA	25	$2,000.00	$50,000
27	Solid waste site - closure, local material	Acre	5	$38,034.22	$190,171
28	Solid waste site - development, local material w/ equipment	Acre	10	$90,929.16	$909,292
29	Shop / Garage, no foundation, concrete floor	SF	400	$383.45	$153,382

Total Estimated Cost: **$15,122,198**

Kivalina Relocation
Planning Project
03003.007

Kivalina Site Estimate

Sitework
Cost Estimate
Kivalina

June 2006

	Task/Item		Quantity		Units/LF	Item LF		Units		Unit Cost		Total
	Site Preparation											
1	Gravel Source Development		1					LS		$10,000.00		$10,000
2	Site Design Survey		1					LS		$10,000.00		$10,000
3	Mob/Demob		1					LS		$130,000		$130,000
4	Site Pad Gravel (6.5 ft)		1,068,383		28,846,350	6.50		CY		$70		$74,786,832
5	Move Buildings	(Figured into Labor)										
6	Road to Site Gravel		0					LF		$450		
7	Road to Runway Gravel		0					LF		$450		
8	Road Bridge		0					LF		$200		
9	Road Culvert		0					LF		$25		
10	Hi-Density Insulation (8")		0					SY		$45		
11	Geotextile Fabric		97,000					SY		$10		$970,000
12	Boat Staging Gravel (90 X 660 X 6)		13,200					CY		$70		$924,000
13	Barge Staging Gravel (208 X 208 X 5)		1					CY		$70		$70
14	Runway Gravel (6,000 lf)		221,000					CY		$70		$15,470,000
15	Camp Water Fill		1					LS		$60		$60
16	Storm Drainage Piping		14,000					LF		$75		$1,050,000
17	Storm Drainage Manholes		45					EA		$3,000		$135,000
18	Camp Security Fence		1,100					LF		$20		$22,000
19	Gravel Pad Labor/Season (Task Cost Tab)		2							$3,160,000		$6,320,000
20	Village Construction Camp/Season		5							$453,000		$2,265,000
21	Airport Runway Labor/Seas. (Task Cost Tab)		2							$3,160,000		$6,320,000
22	Airport Construction Camp/Season		2							$453,000		$906,000
23	Facility Maintenance Equipment		1					LS				$283,900
	Total Sitework Cost											**$109,602,862**

24	Armor Rock		1		5.0	4,285.0		CY		$50		$1,071,250
26	2"-8" Rip-Rap		1		2.3	4,285.0		CY		$20		$197,110
27	Erosion Fabric		1		3.4	4,285.0		SY		$10		$145,690
28	Sheet Pile Wall		1		20.00	3,825.0		LF		$75		$5,737,500
	Total Errosion Protection Cost											**$7,151,550**

Assumptions

1 * Construction Camp Cost covers the entire construction season.
2 Road bridges will be precast, reinforced concrete manufactured off site and delivered
3 Gravel cost is delivered to site. Placement of gravel is included in Item 19 Gravel Pad Labor
4 Camp water line will be of different length depending on the location of the site. Length used is a guess from knowledge of site area.
5 All periods used for construction duration have been taken from Kivalina Master Relocation Schedule, Phase 6, dated 11/16/04
6 Site survey shown here is for initial design survey. Survey required during construction is included in Items 20, 22. Design survey for airport is included.
7 Mob/Demob cost shown is a one-time cost associated with shipping equipment and camp to/from the site and set-up/tear-down at beginning/end of project.
8 Item 4 Site Pad Gravel is calculated using 2-depth; one using gravel alone and a second using gravel over hi-density foam insulation.
9 Items 5, 6 are gravel costs for material volume required to build roads to access the sites. Labor for placement is included in Items 19, 21.
10 Items 7, 8 are guesses at the number of water course spanning structures required for the roads. These numbers will differ depending on the length of road needed.
11 Armor Rock shown in Item 24 is assumed to be minimum 4-man rock.
12 Sheet pile is assumed to be vinyl, not steel. We don't have a lot of soil behind it and it doesn't corrode.
13 The 2"-8" rip-rap shown in Item 26 is fill behind Armor Rock.
14 Facility Maintenance Equipment item assumes contractor will leave used: backhoe/loader, road grader, small dozer, 10 YD dump truck for community use at construction completion.

Grader, 1999 Cat 140HNA	$145,000.00
Backhoe/Loader, 2001 Cat 416C	$45,000.00
Dozer, 1998 Cat D4CIIIXL	$54,000.00
Dump Truck, 1998 Ford L9501	$39,900.00
	$283,900.00

Equipment prices obtained from in internet search of equipment for sale.
15 Sheet piling is assumed to be driven 14 ft into the ground and extend 6 ft above existing grade for a total height of 14 ft

Estimated Costs

Village

Kivalina

Item No.	Line Item Description	Unit	Estimated Quantity	Adjusted Unit Cost	Total Cost
1	Household water and sewer plumbing	EA	100	$20,267.59	$2,026,759
2	Sewage collection mains or services (gravity or force), buried	LF	4,590	$109.12	$500,878
3	Sewage collection mains or services (gravity or force), above ground	LF	0	#DIV/0!	$0
4	Sewage lift station	EA	4	$183,282.02	$733,128
5	Vacuum sewer plant, no foundation	SF	2,500	$487.80	$1,219,492
6	Septic tank, and drainfield, individual household	EA	0	#DIV/0!	$0
7	Septic tank, community	EA	0	#DIV/0!	$0
8	Drainfield, community	SF	0	#DIV/0!	$0
9	Utilidors, above ground, including water and sewer, mains or services	LF	5,000	$286.71	$1,433,543
10	Sewage lagoon, barrow, local material	Acre	10	$201,278.84	$2,012,788
11	Sewage ocean outfall	LF	500	$350.98	$175,491
12	Water distribution, mains or services, above ground	LF	4,090	$107.81	$440,929
13	Water distribution, mains or services, buried	LF	13,000	$86.08	$1,119,049
14	Water storage tank, no foundation	Gal	460,000	$1.63	$750,318
15	Water treatment plant, no foundation	SF	2,500	$590.47	$1,476,176
16	Washeteria, no foundation	SF	800	$747.19	$597,756
17	Foundation - conventional, local gravel material	SF	750	$334.70	$251,026
18	Foundation - freeze back piles	SF	0	#DIV/0!	$0
19	Foundation - thermosyphen stablized gravel pad	SF	0	#DIV/0!	$0
20	Boardwalk	LF	0	#DIV/0!	$0
21	Road, local gravel source	LF	0	#DIV/0!	$0
22	Water source - surface water intake	EA	1	$185,500.02	$185,500
23	Water source - ground water well	EA	0	#DIV/0!	$0
24	Water heating system (boiler system in water treatment building)	EA	1	$2,500.00	$2,500
25	Water delivery piping system (from source to treatment plant)	LF	10,000	$200.00	$2,000,000
26	Fire suppression system (fire hydrants around the village)	EA	25	$2,000.00	$50,000
27	Solid waste site - closure, local material	Acre	5	$38,034.22	$190,171
28	Solid waste site - development, local material w/ equipment	Acre	10	$90,929.16	$909,292
29	Shop / Garage, no foundation, concrete floor	SF	400	$383.45	$153,382

Total Estimated Cost: **$16,228,178**

Transportation System Costs

6/19/2006

Kivalina Relocation Project

CAPITAL COSTS

Description	Unit Cost	Quantity	Total
Hovercraft Cost			
Base Cost	$329,970.00	3	$989,910.00
On Board Spares Kit	$1,554.00	3	$4,662.00
Air Conditioning	$6,121.00	3	$18,363.00
Shipping Pallet	$739.00	3	$2,217.00
Shrink Wrap	$585.00	3	$1,755.00
Spreader Bar to Lift Craft	$1,183.00	3	$3,549.00
Boarding Ladder w/Handrail	$616.00	3	$1,848.00
			$1,022,304.00

	Weight (lbs)	Quantity	# Hundred Weight	Rate per C-weight	
Truck Shipping Cost	9,325.00	3	93.25	$50.00	$4,662.50
Barge Shipping Cost	9,325.00	3	93.25	$150.00	$13,987.50
					$18,650.00

Technical Costs	Unit Cost	Units	Quantity	
Technical Assistance (Technicians + Instructor)	$6,000.00	3	1	$18,000.00
Airfare RT	$1,750.00	3	1	$5,250.00
Room & Board	$75.00	3	15	$3,375.00
Miscellaneous				$500.00
				$27,125.00

Hanger Costs	Unit Cost	Units	Quantity	
Storage and Maintenance Hanger	$300.00	5000	1	$1,500,000.00

Total Capital Costs	**$2,568,079.00**

Transportation System Costs

OPERATION & MAINTENANCE COSTS

Annual Maintenance	Unit Cost	Quantity	Interval Hours	Arctic* Operations	Total
Engine					
Major Overhaul (Arctic Conditions)	$14,166.67	1	8000	$1.77	$5,814.45
Adjust Engine Valve Clearance	$41.67	1	1000	$0.04	$131.40
Routine Oil Change (Liters)	$2.50	22	250	$0.22	$722.70
Routine Oil Filter Change	$39.17	1	250	$0.16	$525.60
Routine Air Filter Change	$84.17	1	2000	$0.04	$131.40
Thrust Unit					
Replace Upper Pylon Bearings	$483.33	2	4000	$0.24	$793.87
Replace Lower Pylon Bearings	$325.83	2	4000	$0.16	$535.18
Replace Drive Belt	$966.96	1	4000	$0.24	$794.12
Fuel System					
Fuel Consumption (Gals)	$3.00	7	1	$21.00	$68,985.00
Fuel Filter	$20.83	1	500	$0.04	$136.85
Coolong System					
Coolant (Gals)	$7.10	10.58	12000	$0.01	$20.56
Coolant Filter	$47.50	1	500	$0.10	$312.08
Hydraulic System 1 (Lift Fans)					
Hydraulic Fluid	$6.77	72	4000	$0.12	$400.31
Filter	$69.17	1	1000	$0.07	$227.22
Upper & Lower Fan Bearings	$175.50	4	4000	$0.18	$576.52
Hydraulic System 2					
(Coolant Fans, Prop, Rudders & Elevators)					
Hydraulic Fluid	$6.77	72	4000	$0.12	$400.31
Filter	$69.17	1	1000	$0.07	$227.22
Skirt Wear (Over Calm Water)	**Not Used**				
Standard Segment	$40.00	150	800	$7.50	$0.00
Stern Segments	$70.00	25	800	$2.19	$0.00
Skirt Wear (Over Smooth Ice)					
Standard Segment	$40.00	150	400	$15.00	$49,275.00
Stern Segments	$70.00	25	400	$4.38	$14,371.88
See Note X.					
Miscellaneous					
Repair Allowance for Instruments, lights sides, skirt loop, etc	$16.67	1	1	$16.67	$18,253.65

Total Direct Annual O&M Cost for 3 HC's	**$162,635.31**	**per yr**
Total Direct 3-year O&M Cost for 3 HC's	**$487,905.94**	**per 3-yrs**
Capital + 3yr-O&M Costs	**$3,055,984.94**	**TOTAL**

Transportation System Costs

Estimated Annual Use Hours	Hours/Day	Days	Qty of Hovercraft	Total
	3.00	365	3	3285

Assumptions
* Units are in dollars/operated hour
1. Room and board in Kivalina will consist of the three VanAir reps sleeping in the school, as usual, and eating out of the teachers lounge kitchen, fixing their own food.
2. Instruction to teach a max of 9 people (3/craft) to operate the hovercraft is included in the purchase price

3. Transportation costs are estimated to be $50/hundredweight by truck from Ontario to Anchorage. Barge costs have been estimated off the ANTHC cost estimating sheet by using the freight cost of a single family septic tank & drainfield.

X. Skirt wear rate will vary depending on surface conditions and pilot technique
Y. Local costs for consumables will vary
Z. Local operating conditions may affect service interval

Kivalina Relocation
Planning Project
03003.007

Construction Camp
Cost Estimate
Kivalina Site Task Costs

June 2006

	Task/Item	Quantity	Capital Cost	Machine Cost/hr	Personnel Cost/hr	Hours/wk	Weekly Total	Months	First Season Total	Ea Other Season Total
	Camp Cost	Quantity	Capital Cost	Machine Cost/hr	Personnel Cost/hr	Hours/wk	Weekly Total	Months	Season Total	Season Total
					Installation Cost LS					
	ATCO Trailers									
13	Camp Start-up	1	$10,000.00						$10,000	$10,000
14	Sleeping	2	$1,000.00						$1,000	$0
15	Shower/Clothes Washing/Dining	1	$1,000.00						$1,000	$0
16	Office	1	$1,000.00						$1,000	$0
17	Storage Conex	3	$1,000.00						$1,000	$0
18	Food (per weekly meals)	504	$5.00				$2,520	6	$60,480	$60,480
19	Power Genset	1	$0.00		$5,000.00			6	$5,000	$1,000
20	Fuel Tankage	1	$0.00		$3,000.00			6	$3,000	$1,000
21	Operating Fuel (gals/hr)	8		$3.00		168	$4,032	6	$24,192	$24,192
22	Telephone	1	$1,000.00		$2,500.00			6	$2,500	$500
23	Develop Raw Water Source	1		$2,500.00	$7,500.00			6	$10,000	$0
24	Water Treatment Plant	1	$2,500.00	$0.50	$1,000.00	60	$30	6	$4,220	$4,220
25	Water Storage (gal)	250000	$250,000.00		$40,000.00			6	$290,000	$0
26	Sewage Treatment	1	$10,000.00	$0.25	$7,500.00	35	$9	6	$17,710	$1,000
27	Sewage Disposal piping	200	$25.00		$35.00				$12,000	$0
28	Camp Shut-down	1	$10,000.00						$10,000	$10,000
	Total								**$453,102**	**$112,392**

Assumes Genset and fuel system is owned by contractor and shipped to site
Assumes ATCO trailers owned by contractor- only cost is installation & operation: Mob/Demob covered under separate item
Assumes water storage tank is permanent tank for village

TOTAL:	$902,670

Kivalina Relocation
Planning Project
03003.007

Construction Camp
Cost Estimate
New Site Task Costs

June 2006

	Task/Item	Quantity	Capital Cost	Machine Cost/hr	Personnel Cost/hr	Hours/wk	Weekly Total	Months	Season Total	Season Total
	Camp Cost/Day	Quantity	Capital Cost	Machine Cost/hr	Personnel Cost/hr	Hours/wk	Weekly Total	Months	Season Total	Season Total
					Installation Cost LS					
	ATCO Trailers									
10	Camp Start-up	1	$10,000						$10,000	$10,000
11	Sleeping	2	$1,000						$1,000	$0
12	Shower/Clothes Washing/Dining	1	$1,000						$1,000	$0
13	Office	1	$1,000						$1,000	$0
14	Storage Conex	3	$1,000						$1,000	$0
15	Food (per weekly meals)	504	$5				$2,520	6	$60,480	$60,480
16	Power Genset	1	$0		$5,000.00			6	$5,000	$1,000
17	Fuel Tankage	1	$0		$3,000.00			6	$3,000	$1,000
18	Operating Fuel (gals/hr)	8		$3.00		168	$4,032	6	$24,192	$24,192
19	Telephone	1	$1,000		$2,500.00			6	$2,500	$1,000
20	Develop Raw Water Source	1		$2,500.00	$7,500.00			6	$10,000	$0
21	Water Treatment Plant	1	$2,500	$0.50	$1,000.00	60	$30	6	$4,220	$4,220
22	Water Storage (gal)	5000	$1,000		$2,500.00			6	$3,500	$0
23	Sewage Treatment	1	$10,000	$0.04	$7,500.00	35	$1	6	$17,534	$1,000
24	Camp Security Fencing	1100	$20,000							$0
26	Camp Shut-down	1	$10,000						$10,000	$10,000
	Total								**$154,426**	**$112,892**

Assumes Genset and fuel system is owned by contractor and shipped to site
Assumes ATCO trailers owned by contractor- only cost is installation & operation: Mob/Demob covered under separate item

TOTAL:	$605,994

Power and Fuel Cost Summary

	Task/Item	Simiq	Tatchim Isua	Imnakuk	Kivalina	Kiniktuuraq	Igrugaivik	Kuugruak	Notes
1	**Electical Distribution**	$1,236,500	$1,236,500	$1,236,500	$1,236,500	$1,236,500	$1,236,500	$1,236,500	(1)
2	**Communications**	$640,000	$640,000	$640,000	$640,000	$640,000	$640,000	$640,000	(2)
3	**AVEC Generation**	$2,165,000	$2,165,000	$2,165,000	$2,165,000	$2,165,000	$2,165,000	$2,165,000	(3)
4	**Heat Recovery**	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	(4)
5	**Wind Generation**	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	(5)
	Total Electrical Costs	**$5,291,500**	**$5,291,500**	**$5,291,500**	**$5,291,500**	**$5,291,500**	**$5,291,500**	**$5,291,500**	**(6)**

Notes

1 Overhead electrical distribution system throughout village including: MV (15kV) conductors, poles, transformers, switches, cutouts and junction devices. Underground system cost similar.

2 Overhead telecommunications distribution system throughout village including: Copper telephone cabling, Cable TV cabling, fiber optic cabling and switches and routing devices. Underground system cost similar.

3 Including all modules, installation, generation equipment, site and pad work and utility connections.

4 Including module, all equipment, installation and interconnection.

5 Including turbines, installation and interconnection.

6 At this stage of design electrical costs for all sites similar. Minor adjustments are anticipated as the design progresses further.

KIVALINA BUILDINGS
COST ANALYSIS FOR
MOVING AND CONSTRUCTION OF
NEW BUILDINGS

TNH BLDG #	DOWL BLDG #	BUILDLING NAME	NO. OF UNITS	COST PER UNIT	SUBTOTAL	COSTS	
						RELOCATION	REPLACEMENT
45	28	City Storage Building	N/A	N/A	N/A	$226,850	$336,000
48	29	IRA Office	N/A	N/A	N/A	$717,850	$862,400
52	33	Post Office	N/A	N/A	N/A	abandon	$560,000
66	42	Episcopal Church	N/A	N/A	N/A	$360,250	$756,000
74	46	Boys & Girls Club	N/A	N/A	N/A	$301,600	$985,600
75	47	Community Center / Bingo Hall	N/A	N/A	N/A	abandon	$918,400
77	50	National Guard Armory	N/A	N/A	N/A	$282,850	$1,280,000
79	52	Old Clinic	N/A	N/A	N/A	$249,650	$280,000
80	53	New Clinic	N/A	N/A	N/A	$226,850	$608,000
94	-	Friends Church	N/A	N/A	N/A	abandon	$588,000
120	89	School Shop	N/A	N/A	N/A	$244,100	$446,400
122	80	Native Store / Warehousing	N/A	N/A	N/A	abandon	$720,000
123	81	Native Store Storage	N/A	N/A	N/A	abandon	$218,400
128	82	Kivalina Native Store	N/A	N/A	N/A	$816,800	$937,200
131	93	Teacher Storage	N/A	N/A	N/A	abandon	$216,000
143	-	School Relocatable	N/A	N/A	N/A	$69,550	$0
144	60	Washeteria / Water Treatment Plant	N/A	N/A	N/A	abandon	N/A
xx	xx	Residential Homes (71 each)	71	$300,000	$21,300,000	abandon	$21,300,000
107	xx	School	N/A	N/A	N/A	abandon	$25,000,000

shaded cell is used for cost estimates

TOTAL RELOCATION COSTS (MOVE BUILDINGS) =	**$1,124,950**
TOTAL REPLACEMENT COSTS (NEW BUILDINGS) =	**$52,692,400**

Building 45 – City Storage

Year of Construction: unknown

Type of Construction: Foundation – 4x12 Timber Sleeper
Floor – Lumber joists on top of foundation
Walls – Wood stud with T1-11 siding
Roof – 3:12 Truss with metal roofing
Mechanical/Heating – unknown
Electrical – unknown

Building Size: 28 x 40 = 1,120 sq. ft.

Condition: This building appears to have gone through an evolution of uses with decreasing levels of maintenance. The siding does not extend over and past the floor framing or the wall sill plates. The floor system is covered with a 2x lumber trim board which also acts as a rim joist. Given that the floor framing and wall sill plates are not protected from the weather, it is suspected that significant rot is present in the structural framing.

Recommendations: Although the building does appear to be relocatable as a single unit, it probably is not worth relocating. Particularly given the high probability of rot in the floor system and the building's diminishing value to the community.

Cost:	Relocation	Building Preparation	40 crew hours @ 575	$ 23,000	
		Transport	10 crew hours @ 575	$ 5,750	
		New Foundation	24 crew hours @ 575	$ 13,800	
		Installation	100 crew hours @ 575	$ 57,500	
		Replace Electrical		$ 37,500	
		Replace Plumbing/Heating		$ 60,000	
		ADA Compliance		$ 14,300	
		Materials		$ 15,000	
		Total Relocation Costs			$ 226,850
	Replacement	(Pre-Engineered Metal Bldg)	1120 sq. ft. x $300		$ 336,000

Building 48 - IRA Office

Year of Construction: unknown

Type of Construction: Foundation – Timber Beam on Buried Timber Piers
Floor System – 1st Floor, Exposed Lumber joists
Floor System – 2nd Floor, unknown
Wall – Conventional Timber Framing with Plywood sheathing on 1st Floor and T1-11 Sheathing on 2nd Floor
Roof – 4:12 Truss with metal roofing
Mechanical/Heating – Oil Fired Forced Air Furnace with secondary room heaters.

Building Size: 28x44; 1232 sq. ft. / floor x 2 = 2464 sq. ft.

Condition: This building started out as a single story building. The building was at some point raised and a new first floor was in-filled. This in-fill appears to have been constructed without the benefit of engineering or under the guidance of a skilled construction superintendent. The building photos revealed that the floor framing and the grade beam are in violation of the building code for moisture proofing and loading. The wall openings for doors and windows have no structural headers. The interior stairway violates the code requirement for rise, run and landings.

The forced air heating system appears to be a residential unit that is seriously undersized for this building, particularly in the ductwork.

Given the extensive use of electrical extension cords, it appears that the building's electrical system is also undersized for this facility. The photos do reveal a code violation at the breaker panel with the exposed surfaced mounted romex.

Recommendations: It appears that the original portion of the building could be relocated. However, the in-filled first floor would require an extensive amount of shoring and bracing in order to make it strong enough to survive relocating the building intact. Then once in place, the in-filled first floor would require structural retrofitting to bring it minimally into code compliance. Relocation of this building is not recommended.

Cost: Relocation

Building Preparation	40 crew hrs @ 575	$ 23,000	
Second Floor temporary falsework	60 crew hrs @ 575	$ 34,500	
First Floor demolition	60 crew hrs @ 575	$ 34,500	
Second Floor Lowering & Trailoring	24 crew hrs @ 575	$ 13,800	
Transport	10 crew hrs @ 575	$ 5,750	
Second Floor Jackup & Falsework	60 crew hrs @ 575	$ 34,500	
New Foundation (Post on Pad)	24 crew hrs @ 575	$ 13,800	
New First Floor & Stairway	1232 sq ft @ 350	$ 431,200	
Replace heating system and plumbing		$ 60,000	
Replace electrical		$ 37,500	
ADA Compliance		$ 14,300	
Materials		$ 15,000	
Total Relocation Costs			$ 717,850

Replacement

2464 sq. ft x $350	$ 862,400

Building 52 – U.S. Post Office

Year of Construction: estimated 1979 - 1980

Type of Construction: Modular wood framed building on an unknown foundation type
Heating: preway oil burner, appears inactive; 2 monitor type room heaters

Building Size: 10x54 = 540 sq. ft.

Condition: This building was originally developed in the early 1980s by USPS as a short-term solution to the postal needs of Alaska's remote communities. The minimum facility specifications of the USPS has undergone significant revisions during the last twenty years. The biggest impact on this facility are the more recently adopted security measure and accessibility standards.

Recommendations: Although this building can be relocated with minimal preparation or retrofitting, it does not meet the minimum standards for a Postal Facility. Therefore, replacement is the more cost effective solution.

Cost: Relocation N/A

Replacement (USPS Min) 1100 sq. ft. x $500 = $560,000

Building 66 – Episcopal Church

Year of Construction: unknown, with recent addition

Type of Construction: Foundation: Timber beam on timber crib
Floor: lumber floor joists
Walls: conventional framing with plywood sheathing
Addition has T1-8 sheathing
Roof: 4:12 Scissor Truss with metal roofing
Heating: 2 monitor style room heaters

Building Size: 30x72 = 2160 sq. ft. single-story

Condition: The building appears to be well maintained and deterioration of its structural systems were not noted in the photographs. The electrical system appears to be outdated, particularly the breaker panel has not been produced for several decades.

Recommendations: Simply through the passage of time, the electrical system no longer meets code and will have to be replaced. The floor system appears to be overstressed given the wide spacing of the floor joists in the addition. Additional joists will need to be added to bring the floor loading capacity into the code minimum. The building does appear to be relocatable but it will have to be cut into sections width-wise in 24-foot section. These sections will then need to be temporarily reinforced.

Cost: Relocation

Building Preparation	40 crew hrs @ 575	$ 23,000	
Separate Modules (3 modules @ 20)	60 crew hrs @ 575	$ 34,500	
Transport (3 modules @ 10)	30 crew hrs @ 575	$ 17,250	
New Foundation (Post on Pad with Glu-Lam)	24 crew hrs @ 575	$ 13,800	
Remarry Modules (3 modules @ 40)	120 crew hrs @ 575	$ 69,000	
Building Installation	100 crew hrs @ 575	$ 57,500	
Floor Stiffening	32 crew hrs @ 575	$ 18,400	
Replacement of Electrical System		$ 60,000	
Install new Plumbing and Heating		$ 37,500	
ADA Compliance		$ 14,300	
Materials		$ 15,000	
Total Relocation Costs			$ 360,250

Replacement: 2160 sq. ft. x $350 $ 756,000

Building 74 – Boys & Girls Club

Year of Construction: unknown

Type of Construction: Foundation: Post on Pad
Floor: Joists (lumber or BCI?) on top of Glu-Lam
Walls: conventional framing, deep wall (2x8?) with T1-11 sheathing
Roof: 4:12 Truss with metal roofing
Heating: monitor style space heaters

Building Size: 44x64 = 2816 sq. ft. single-story

Condition: The building appears to be structurally sound. Depending on the type of roof used, it is possible to relocate this building by splitting it in half lengthwise. The electrical breaker panel is in serious disrepair and does present an eminent life-safety condition. It needs to be repaired immediately.

Recommendations: This building is a good candidate for relocation. However, given its width, it will probably need to be split in half lengthwise with temporary structural reinforcing along the marriage line of each half. Assuming full-length trusses, an engineering gusset or load-bearing beam will be required to remarry the sections.

Cost: Relocation

Building Preparation	40 crew hrs @ 575	$ 23,000	
Separate Modules	40 crew hrs @ 575	$ 23,000	
Transport (2 modules @ 10)	20 crew hrs @ 575	$ 11,500	
New Foundation (Post on Pad)	24 crew hrs @ 575	$ 13,800	
Remarry Modules	80 crew hrs @ 575	$ 46,000	
Building Installation	100 crew hrs @ 575	$ 57,500	
Install Plumbing and Heating		$ 60,000	
Update and repair Electrical		$ 37,500	
ADA Compliance		$ 14,300	
Materials		$ 15,000	
Total Relocation Costs			$ 301,600

Replacement: 2816 sq. ft. x $350 $ 985,600

Building 75 – Community Center / Bingo Hall

Year of Construction: photo indicates construction during the late 1950s / early 1960s

Type of Construction: Foundation: Timber Post on Wood Sleeper
Floor: assumed lumber joists
Walls: conventional framing with plywood sheathing
Roof: assumed on-site built knee-brace truss with metal roofing
Heating: very old oil-fire furnace force air room heat; i-monitor style room heater
Electrical: surface mounted in conduit

Building Size: 41x64 = 2624 sq. ft.

Condition: The original building appears to have been 30x64 with a small arctic entry. The building was then enlarged with a 12-foot wide full length addition and the arctic entry was made wider. The roof of the addition was installed by simple spanning to the then existing roof plane and sheathed over.

The building has suffered from a lack of effective maintenance and is exhibiting conditions of advanced rot in the sheathing. Additionally, all ventilation to the roof system has been closed off making it highly likely that rot is occurring in the roof system.

Recommendations: Replacement only

Cost: Relocation N/A

Replacement: 2624 sq. ft. x $350 = $918,400

Building 77 - Armory

Year of Construction: original building – late 1960s / early 1970s
Addition – mid 1980s

Type of Construction: Foundation – Original: modified post on pad
Foundation – Addition: post on pad
Floor: original bldg assumed lumber joist
Walls: original bldg assumed conventional framing
Roof - Original: unknown
Roof – Addition: appears to be either pre-manufactured module or panelized
Heating: unknown
Electrical: unknown

Building Size: Original: 20x60 = 1200 sq. ft.
Addition: 30x40 with 10x16 hall connection = 1360 sq. ft.
Total Building Size 2560 sq. ft.

Condition: The addition is fairly recent and appears to be sound. This building can be relocated but the method of relocation depends on whether it is a modular or panelized building.

The original building also appears to be structurally sound. However, at some point in time, urethane foam was applied to the underside of the building. Urethane foam locks moisture into the surfaces that it is applied to and accelerated rot is introduced within the first year or two after application. This warrants detailed investigation and testing.

Recommendations: Assuming that no rot is present in the floor system of the original building, the facility is a good candidate for relocation.

Cost: Relocation

Building Preparation	40 crew hrs @ 575	$ 23,000	
Transport	10 crew hrs @ 575	$ 5,750	
New Foundation	24 crew hrs @ 575	$ 13,800	
Building Installation	100 crew hrs @ 575	$ 57,500	
Reconstruction of Hallway	160 sq ft @ 350	$ 56,000	
Heating/Plumbing Update		$ 60,000	
Electrical System Update		$ 37,500	
ADA Compliance		$ 14,300	
Materials		$ 15,000	
Total Relocation Costs			$ 282,850

Replacement: 2560 sq. ft. x $500 $ 1,280,000

Building 79 – Old Clinic

Year of Construction: late 1970s / early 1980s

Type of Construction: Foundation: Double 2x sistered beam on buried log pier
Floor: Assumed lumber joist with plywood soffit
Walls: conventional framing with plywood sheathing
Roof: 4:12 Truss with metal roofing
Heating: monitor style room heaters
Electrical: surface mounted in conduit

Building Size: 20x40 = 800 sq. ft.

Condition: This building appears to be structurally sound. However, the structural sheathing indicates significant amounts of delamination. Mold growth is noted to be occurring on the shade side of the building. Therefore, the remaining strength of the sheathing is questionable. The interior hallway width does not appear to meet code.

Recommendations: With the replacement of the exterior sheathing, this building is a good candidate for relocation.

Cost: Relocation

Building Preparation	40 crew hrs @ 575	$ 32,000	
Sheathing Replacement	24 crew hrs @ 575	$ 13,800	
Transport	10 crew hrs @ 575	$ 5,750	
New Foundation (Post on Pad)	24 crew hrs @ 575	$ 13,800	
Building Installation	100 crew hrs @ 575	$ 57,500	
Install Plumbing and Heating		$ 60,000	
Install Electrical		$ 37,500	
ADA Compliance		$ 14,300	
Materials		$ 15,000	
Total Relocation Costs			$ 249,650

Replacement: 800 sq. ft. x $350 $ 280,000

Building 80 – New Clinic

Year of Construction: mid 1980s

Type of Construction: Foundation: wood framed plywood shear perimeter wall and beam on timber pier midwall
Floor: TJI with plywood soffit on bottom flange
Walls: conventional framing with plywood sheathing. A combination of T1-11 and shiplap siding is applied over the sheathing.
Roof: 4:12 Truss with metal roofing
Heating: oil fired forced air furnace

Building Size: 32x38 = 1216 sq. ft.

Condition: This building appears to be structurally sound. However, it does suffer from a lack of effective maintenance. The photo of the secondary egress door is curious and may simply be distortion in the photo. However, if it is not, the door distortion combined with the bowing of the ceiling tile track are an indication of structural failure in the building wall. This needs to be clarified.

The sanitary waste line in the crawl space indicated that this building has a long history of failure and patch job repairs. The waste lines must be fully replaced.

The forced air heating system is also suffering from a lack of servicing and several minor code violations are apparent in the photos.

The electrical system appears to be seriously undersized and overstressed. This is evidenced by the numerous post-it notes on the breaker panel and the spaghetti web of extension cords. This building is a high risk of electrically-generated fire.

Recommendations: Although this building is relocatable, it is seriously undersized and under--equipped to meet the current federal and state health care standards. Therefore, its relocation is not recommended unless it is for an alternate function.

Cost:	Relocation	Building Preparation	40 crew hrs @ 575	$ 23,000	
		Transport	10 crew hrs @ 575	$ 5,750	
		New Foundation	24 crew hrs @ 575	$ 13,800	
		Building Installation	100 crew hrs @ 575	$ 57,500	
		Install Plumbing/Heating		$ 60,000	
		Install Electrical		$ 37,500	
		ADA Compliance		$ 14,300	
		Materials		$ 15,000	
		Total Relocation Costs			$ 226,850
	Replacement:	1216 sq. ft. x $500			$ 608,000

Building 94 – Friends Church

Year of Construction: Original – unknown
Addition - unknown

Type of Construction: Foundation: grade beam on sleepers
Floor: lumber joists
Walls: conventional framing with T1-8 sheathing
Roof - Original: simple span joists with offset at ridge beam, asphalt singles and on-roof ventilators.
Roof – Addition: 4:12 Truss with metal roofing
Heating: monitor style room heater

Building Size: Original: 24x42 = 1008 sq. ft.
Addition: 24x28 = 672 sq. ft. Total Size = 1,680 sq. ft.

Condition: This building appears to be structurally sound and has had a good level of maintenance. However, the asphalt roofing on the original building is in dire need of replacement evidenced by the deterioration of the roofing shingles. It is highly likely that water and moisture has entered the roof system and that rot is present throughout.

The building appears to be in violation of the building code for minimum Light and Vent and for Exiting. However, these can be easily corrected.

The photos indicate that there is only one room heater for the entire building. Since this is a place of assembly, the mechanical code does require a much higher level of heating and ventilation.

Recommendations: This facility does appear to be relocatable. However, the condition of the roof system of the original building needs to be evaluated prior to making the determination.

Given that the building is founded on grade beams, the preparation of the building for moving will require excavation (by hand) around and under the building for insertion of support beams.

Additionally, this building will need to be separated at the marriage line of the original building and the addition.

Once moved, the building will require installation of additional windows, at least one more fire exit and a complete heating/ventilation system.

The relocation of this building will be a time and labor consumptive process just to get it prepared for relocation. Additionally, during the excavation process, the building will be at risk for failure if it becomes overstressed. Therefore, its relocation is not recommended.

Cost: Relocation N/A

Replacement: 1680 sq. ft. x $350 = $588,000

Building 107 McQueen School

Year of Construction: early to mid 1980s

Type of Construction: Foundation – Pile, appears to be steel
Floor – web truss assumed
Walls – pre-engineered metal frame and/or Glu-lam, assumed
Roof – varies, 2:12 truss at gym, flat roof elsewhere

Building Size: see attached sketch – 20,000 sq. ft.

Condition: The photographs are insufficient to make an assessment. The aerial photograph, see attached, indicates that the building structural elements are broken into four interdependent cells.

Recommendations: This is a fairly large building that does not lend itself well to relocation. The building appears that it can be separated into four modules using a fully engineered system to separate and reinforce each module. This will then result in four large modules that will require custom trailoring to transport. However, until more information is known, relocation of this complex building is not recommended.

Cost: Relocation N/A, insufficient information available.

Replacement 20000 sq. ft. x $500 = $10,000,000

Building 120 School Shop

Year of Construction: unknown

Type of Construction:
Foundation (Original & 1st Add'n) – Timber beam on Log Pier
Foundation (Generator Add'n) – unknown
Floor (Original) – TJI on top on lumber beams
Floor (1st Add'n) – Lumber joists inset between floor beam
Floor (Generator Add'n) – Floor on grade
Walls – Conventional framing with T1-8 Sheathing on original and generator addition; plywood on 1st Addition.
Roof (Original) – 3:12 Truss with metal roofing
Roof (1st Add'n) - Lumber joist shed roof with metal roofing
Roof (Generator Add'n) – Simple span lumber joist
Mechanical/Heating – 2 monitor-style room heaters
Electrical – unknown

Building Size:
(Original) 24 x 40 = 960 sq. ft.
(1st Add'n) 24x12 = 288 sq. ft.
(Generator Add'n) 20x12 = 240 sq. ft.
Total Building Size = 1488 sq. ft.

Condition: The original building and the 1st Addition appear to be structurally sound and are good candidates for relocation. The generator addition does not appear to be structurally strong enough to survive relocation. The standby generator is installed on top of timber sleepers with no lateral supports and is at risk of overturning when in operation.

Recommendations: The generator addition is structurally deficient and will not survive relocatation. The original building and 1st Addition can be relocated as separated whole-width modules. The electrical system will need to be update to bring it into code compliance.

Cost:	Relocation	Building Preparation	40 crew hours @ 575	$ 23,000	
		Module Separation	20 crew hours @ 575	$ 11,500	
		Generator Room Demo	10 crew hours @ 575	$ 5,750	
		Transport	10 crew hours @ 575	$ 5,750	
		New Foundation	24 crew hours @ 575	$ 13,800	
		Installation	100 crew hours @ 575	$ 57,500	
		Electrical Update		$ 37,500	
		Plumbing/Heating		$ 60,000	
		ADA Compliance		$ 14,300	
		Materials		$ 15,000	
		Total Relocation Costs			$ 244,100
	Replacement	(Pre-Engineered Metal Bldg) 1488 sq. ft. x $300			$ 446,400

Building 122 – Native Store / Warehousing

Year of Construction: The original building appears to be consistent with construction methods of pre-1960 and there has been 5 additions made since then.

Type of Construction: This facility is all wood frame construction with each addition utilizing different techniques.

Building Size: 2,400 sq. ft.

Condition: This seems to be a very complicated structure. It appears that the original building is the only structurally independent element of the complex.

Recommendations: Given the structural interdependence of each addition to each other, relocation of this facility is not a viable option. Therefore, it should be replaced.

Cost:	Relocation	N/A	
	Replacement:	(Pre-engineered metal building) 2400sq. ft. x $300	$720,000

Building 123 – Native Store Warehouse

Recommendations: This building is a threat to life safety and needs to be condemned. Replace with pre-engineered metal building.

Cost: Relocation N/A

Replacement: Pre-Engineered Metal Bldg (26x28) 728 sq. ft. x $300 = $218,400

Building 128 – Native Store

Year of Construction: early 1990s

Type of Construction: Foundation: unknown, the foundation is fully skirted
Floor: unknown, probably TJI on Glu-Lam
Walls: appears to be a pre-engineered metal building
Roof: see Walls
Heating: oil fired forced air furnace
Electrical: unknown

Building Size: 42x60 with buildouts 1) 8x10, 2) 18x10, 3) 10x8 and 4) 22x12 = 3124 sq. ft.

Condition: The photography provided is not sufficient to make an informed determination. However, the electrical system at the breaker panel has been modified with numerous code violations evident in the photo.

Recommendations: Relocation of this building will require that it be disassembled into panelized sections and reassembled at the new site.

Cost:	Relocation	Disassembly	400 crew hours @ 575	$ 230,000	
		Reassembly	800 crew hours @ 575	$ 460,000	
		Replace Mechanical		$ 60,000	
		Replace Electrical		$ 37,500	
		ADA Compliance		$ 14,300	
		Materials		$ 15,000	
		Total Relocation Costs			$ 816,800
	Replacement:	Pre-Engineered Metal Bldg	3124 sq. ft. x $300		$ 937,200

Building 131 Teacher Storage

Recommendations: This building is in a serious state of deterioration and will not survive relocation. Therefore it should be replaced.

Cost: Relocation N/A

Replacement: Pre-engineered Metal Building (18x40) = 720 sq. ft x $300 = $216,000

Building 143 School – Relocatable Classroom

Recommendations: This is a recently installed modular building that is designed to be relocated and still has its trucks installed. Therefore, the costs to be relocated and make operational will be minimal.

Cost:	Relocation	Building Preparation	40 crew hours @ 575	$ 23,000	
		Transport	10 crew hours @ 575	$ 5,750	
		Foundation (use existing)	10 crew hours @ 575	$ 5,750	
		Installation	10 crew hours @ 575	$ 5,750	
		Electrical Update (n/a)		0	
		Mechanical Update (n/a)		0	
		ADA Compliance		$ 14,300	
		Materials		$ 15,000	
		Total Relocation Costs			$ 69,550
	Replacement:	N/A			

Building 144 Washeteria / Water Treatment Plant

Year of Construction: early 1980s

Type of Construction: Foundation – Timber beam on Post with buried pad
Floor – TJI floor joist on top of beam
Walls – Conventional framing with T1-11 Sheathing
Roof – 4:12 Truss with metal roofing

Building Size: Two sections of 18x28 = 1008 sq. ft.

Condition: This is a well-maintained facility that is structurally sound. No obvious code deficiencies were noted in the photos.

Recommendations: Although this building is a good candidate for relocation from a structural standpoint, it is not practical to do so because of the highly sophisticated and complex mechanical/electrical systems. Given that the new community site is intended to have a fully piped water supply and sewer systems, this facility's systems simply cannot be retrofitted for the new community.

Cost: Relocation N/A

Replacement 2400 sq. ft. (minimum) x $500 = $1,200,000

46'
75'
86'
62'
96'
14'
11'
62'
24'
124'
62'

Kivalina Gravel Cost / Time Analysis

OBJECTIVE: DETERMINE TIMELINE AND COST TO CONSTRUCT GRAVEL/SITE PAD.

ASSUME:

1). OBTAIN FILL/GRAVEL FROM KISIMIGIUK HILL WITH BLASTING TECHNIQUES.

2). PERMITS ARE PART OF EA/EIS PROCESS AND DO NOT IMPACT SCHEDULE.

3) BARGE EQUIPMENT IN DURING SUMMER. USE ICE ROADS TO MOVE EQUIPMENT TO KISIMIGUK HILL

4). HAUL DISTANCE EQUAL BETWEEN 2½ miles to 7 MILES, DEPENDING ON THE SITE. DISTANCE IS ONE-WAY.

5). HAUL ROAD 5 feet deep by 30 FEET WIDE.

SOLUTION:

Quantity for Road/Site Pad = 1,536,193 yd^3 w/ oct road
1,844,193 yd^3 w/ road

Time to Haul Analysis

Assume: 1) winter notice to proceed

2) Lease equipment for barge delivery in summer

3) store equipment and camp supplies in Kivalina until January, haul/drive to gravel site.

4) Drill blast from Jan through construction end.

5) Haul/place fill from late April on continue throughout Project. Place over tundra w/ Fabric. Scrape snow away.

ES.	DATE	Tryck Nyman Hayes, Inc. Engineering • Surveying • Landscape Architecture	Kivalina Gravel / Fill haul time / cost
H'	DATE		
B.	SHEET 1 OF 5		
OB NO.	SCALE		

How Long to Haul?

From meeting with Wilder Construction; Wilder developed / Hauled and placed 1,400,000 yd^3 in a western Alaska site last year. They performed the work in 1-year. They can build a 1.5 to 1.8 million yds pad in 2 to 3 years.

From Anchorage / C street / QAP Contractors - Developed / Hauled / Placed 250,000 yd^3 material in 8 weeks.

ANSWER: HAULING / PLACING DEPENDS ON EQUIPMENT.

Based placement by Quantity. Wilder states they can place 20,000 yds per week, they can also place 1.5 million yd^3 in 1 to 2 yrs.

Assume 8 trucks @ 25 yds each, 7 mile (max) one way trip 40 minutes / trip (Komatsu HT36 or equal articulated truck)

8 * 25yds = 200 yds / round trip = 300 yds / hr

12 hr days = 3,600 day

7 days / week = 25,200 / week

25,200 yd^3 / week * 48 weeks (Full Season Haul)

= 1,209,600 / yr.

Require 1.8 million yds $\frac{1.8}{1.2}$ = 1.5 years.

Placement of fill requires 1.5 yrs, mobilization requires Set-up = 8 weeks

Total time = 1.5 + 8 = 2.3 years.

Say 2 to 3 years

DES.	DATE		
CH	DATE		
E.B.	SHEET 2	OF 5	
JOB NO.	SCALE		

Tryck Nyman Hayes, Inc.

Engineering • Surveying • Landscape Architecture

Kivalina Gravel / Fill
haul time / costs

Costs:

Kivalina gravel study haul $40 hr = $60/yds^3

Ketchabec costs w/ haul = $30/yd^3 (Boyce Construction)

Adjust Kotz costs

Regional / Remote Factor	= 1.5	= $15/yd^3
Winter work Factor =	1.5	$15/yd^3
		$60/yds
Contingency =	20%	+12/yd
		$72/yd

59y $70/yd^3

DES.	DATE		
CI	DATE		
F.B.	SHEET 3	OF 5	Tryck Nyman Hayes, Inc.
JOB NO.	SCALE		Engineering • Surveying • Landscape Architecture

Kivalina Quantity Calculations **2,880,000** short tons

Townsite will cover 100 acres at an average depth of 9 to 14 feet depending on gravel specifications, with 1V:3H sideslopes
Assume townsite is a rectangle 1,500 ft by 2900 ft

Units
1 Acre = 43,560 sq ft.
1 meter = 3.2808 ft.
1 cu yd = 27 cu ft.
1 cu yd = 1.5 short tons
1 cu yd = .7646 cu. meters

Main Townsite pad

			Reduced with Insulation (not recommended due top long term risks)
4,356,000	sq ft		
9.000	depth in ft		5.391 ft
39,204,000	cu ft		23,483,719
1,452,000	cu yds	1,110,199 cu meters	869,767
2,178,000	tons		**1,304,651**

Sideslopes

8,800	ft perimeter		
13.123	ft height		9.514
39.369	ft base		28.543
258.320	sq ft unit area		135.783
2,273,213	cu ft		1,194,894
84,193	cu yds	64,374 cu meters	44,255
126,290	tons	1,174,573 cu meters	66,383
2,304,290	tons		**1,371,034** tons
576,072	25% Contingency		342,759 25% contingency
2,880,362	tons total		**1,713,793** tons total
2,880,000	rounded		**1,714,000** rounded

Access Road

7	Miles	
30	width	
5	Depth	
3	to 1	sideslope
8,316,000	cu ft	
308000	cu yds	
462000	tons	

1,536,193 CUBIC YARDS without road
$ 134,426,496.17 cost for gravel in place

1,844,193 CUBIC YARDS with access road

Reduce Pad Thickness with Insulation (not recommended for a community site pad)

5.1 meters MSL = minimum elevation for flooding
2.2 meters MSL = mean site elevation
2.9 meters = thickness of gravel required for flooding
4.0 meters = thickness of gravel required for thermal insulation
1.1 meters = thickness that could be reduced by use of insulation
3.6 feet = thickness that could be reduced by use of insulation

25 mm of insulation = 300 mm of gravel 91.66667
3.608924

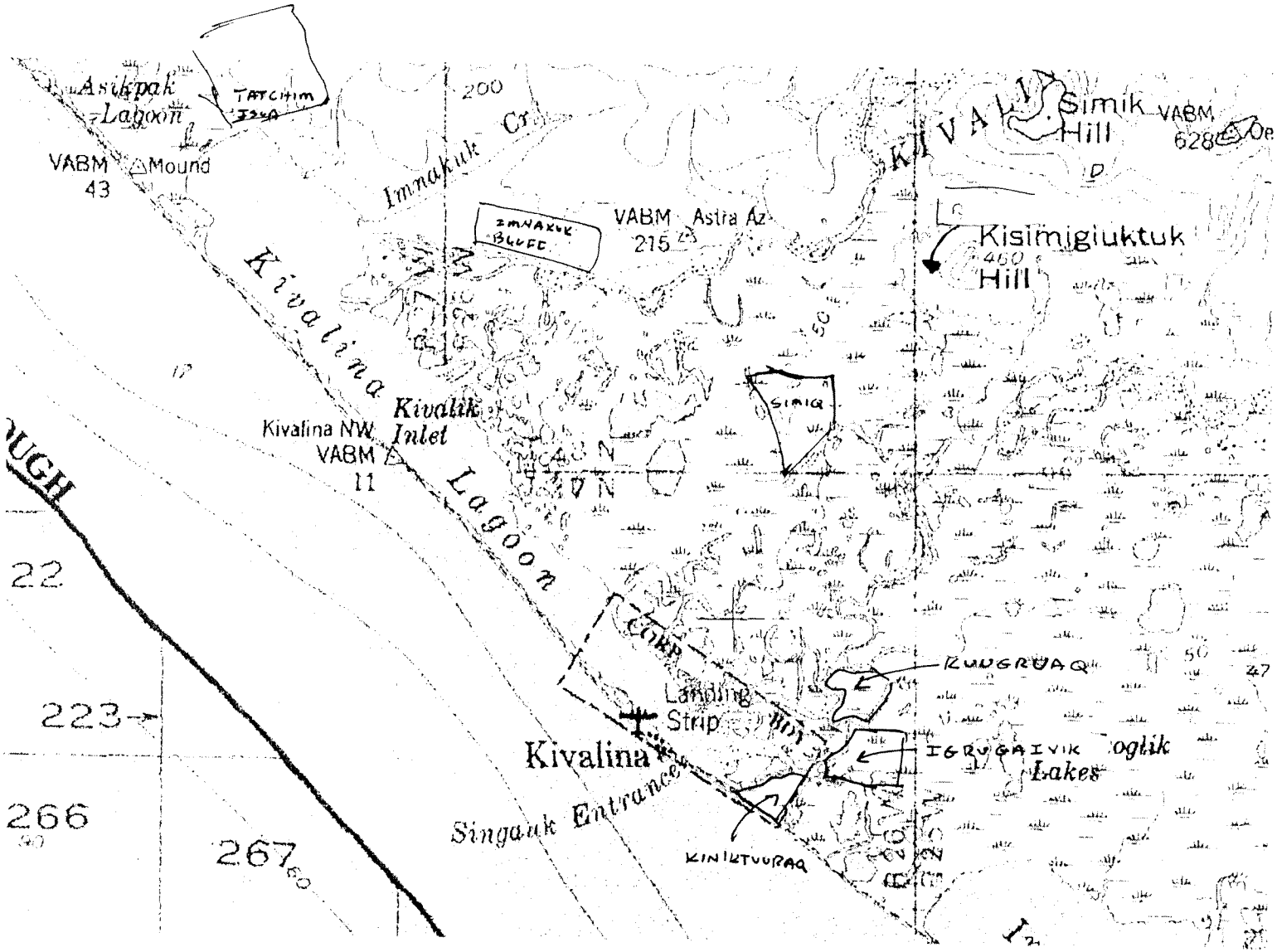
1.1 meters gravel = 3.6 inches of insulation

1,166,000.000 tons reduction
46.670 $/ton (TNH adjusted Corps # of $40/ton)
$54,417,220.00 Savings from gravel reduction

$1.60 Cost of insulation sq ft/in
4,356,000 sq ft
3.6 in insulation
$25,090,560.00 Cost of insulation

$29,326,660 savings based on cost difference between gravel and insulation
(*does not include cost of delivery to site and placement*)

acres		depth	cubic ft	cubic yds	tons
	100	4M			
	4,356,000	13.125	57,172,500	2,117,500	3,176,250
m3		cuyd			
	2,100,000	2,800,000			4200000


Asiłpak Lagoon
TATCHIM IZUA
VABM 43 Mound
200
Imnakuk Cr
IMNAKUK BLUFF
VABM 215 Astra Az
Simik Hill
VABM 628
Kisimigiuktuk Hill
Kivalina Lagoon
Kivalik Inlet
Kivalina NW VABM 11
SIMIQ
RUUGRUAQ
Landing Strip
Kivalina
IGRUGAIVIK
Lakes
Singauk Entrance
KINIKTUURAQ
22
223
266
267
SCALE: ≈ 1" = 2 miles